

REMARKS

Claims 1-14 are presented for consideration, with Claims 1, 4, 7, 10, 13 and 14 being independent.

The independent claims have been amended to further distinguish Applicant's invention from the cited art. Support for the claim amendments can be found, for example, on page 12, line 26, *et. seq.*, of the specification.

Claims 1, 2, 4, 5, 7, 8, 10, 11, 13 and 14 stand rejected under 35 U.S.C. §103 as allegedly being obvious over the Patnaik publication in view of Adeli '394. Additionally, Claims 3 and 9 are rejected as allegedly being obvious over those citations and further in view of the Lingen publication, and Claims 6 and 12 are rejected as allegedly being obvious over Patnaik, Adeli and further in view of the Dickinson publication. These rejections are respectfully traversed.

Applicant's invention as set forth in Claim 1 relates to a method of optimally designing a structure in an area comprising a step of obtaining a solution of a structure optimal designing problem having a first solution process to solve an optimization problem of a first evaluation function for a status variable vector and a design variable vector, wherein the design variable vector is a rate of existence to a structural member in each divided area of the area, and the status variable vector is a displacement in each node of the divided area. The first solution process comprises a design variable update state of reading the design variable vector and the status variable vector stored in a first storage unit, updating the design variable vector, and storing the updated design variable vector into the first storage unit, and a status variable update state. As amended, the status variable update state includes a) reading the design variable vector and the status variable vector stored in a second storage unit, b) performing a second solution

process to solve an optimization problem of a second evaluation function for the status variable vector and the design variable vector so as to obtain the status variable vector which minimizes the second evaluation function as a solution, wherein the second evaluation function corresponds to a norm of a residual vector which is obtained as a difference between a nodal force vector and the status variable vector on which a global stiffness matrix is operated, c) updating the status variable vector with the solution of the optimization problem of the second evaluation function, and d) storing the updated status variable vector into the second storage unit. Additional steps include a determination step of determining whether the update in the design variable update step and the update in the status variable update state are to be terminated, and an output step of outputting an image of the structure corresponding to the design variable vector and the status variable vector after the updates are terminated, and otherwise returning to the design variable update step to update the design variable vector.

In accordance with Applicant's invention, a high performance structure design can be provided.

As discussed in the previous Amendment of September 18, 2008, the primary citation to Patnaik relates to optimizing a procedure for automated structural design. The Office Action asserts that Patnaik discloses a first solution process that includes a design variable update state, a status variable update state, a determination step and an output step as set forth in Claim 1. The Office Action acknowledges that Patnaik does not teach a second evaluation function that corresponds to a norm of a residual vector which is obtained as a difference between a nodal force vector and a status variable vector on which a global stiffness matrix is operated.

The secondary citation to Adeli was cited to compensate for this deficiency. Adeli relates to a computational model provided for design automation and optimization. The Office

Action relies on equation 41 (column 18, line 9), to support its assertion that Adeli teaches a second evaluation function.

Without conceding to the propriety of combining Patnaik and Adeli in the manner proposed in the Office Action, it is submitted that such a combination still fails to teach or suggest Claim 1 of Applicant's invention. For example, in Claim 1 the status variable vector which minimizes the second evaluation function as a solution is obtained by performing a second solution process to solve an optimization problem of the second evaluation function for the status variable vector and the design variable vector, and the second evaluation function corresponds to a norm of a residual vector obtained as a difference between a nodal force vector and the status variable vector on which a global stiffness matrix is operated. The equation 27 of Patnaik, relied on in the Office Action for teaching the second evaluation function, is understood to calculate m displacements X from n forces F (see page 9). Equation 41 in Adeli is understood to calculate a norm of a residual vector. Neither citation, however, is read to obtain a status variable vector which minimizes the second evaluation function, which correspond to a norm of a residual vector obtained as a difference between a nodal force vector and the status variable vector on which a global stiffness matrix is operated. It is submitted, therefore, that both citations fail to teach or suggest at least these features of Applicants' Claim 1. Accordingly, the proposed combination of Patnaik and Adeli, even if proper, still fail to teach or suggest Claim 1 of Applicant's invention.

Claim 4 is directed to a method of optimally designing a structure and includes a status variable update step of reading a design variable vector and a status variable vector stored in a second storage unit, and performing a second solution process to solve an optimization problem of a second evaluation function for the status variable vector and the design variable vector so as to obtain the status variable vector which minimizes the second evaluation function as a solution.

As in Claim 1, the second evaluation function in Claim 4 corresponds to a norm of a residual vector which is obtained as a difference between the nodal force vector and the status variable vector on which a global stiffness matrix is operated. Claims 7 and 13 relate to an information processing apparatus and a program stored in a computer readable storage medium, respectively, and correspond to Claim 1. Claims 10 and 14 relate to an information processing apparatus and a program stored in a computer readable storage medium, respectively, and correspond to Claim 4. These claims are thus also submitted to be patentable for at least the reasons discussed above.

Therefore, reconsideration and withdrawal of the rejection of Claims 1, 2, 4, 5, 7, 8, 10, 11, 13 and 14 under 35 U.S.C. §103 is respectfully requested.

The tertiary citation to Lingen relates to a system having an iterative algorithm to solve non-symmetric systems of equations and was cited for its teaching of a conjugate residual (GCR) method.

The tertiary citation to Dickinson relates to conjugate gradient methods for three-dimensional linear elasticity and is relied on for its teaching of sending a nodal force vector to zero (0) in a preconditioning step.

Both tertiary citations, however, fail to compensate for the deficiencies in the proposed combination of Patnaik and Adeli as discussed above. Therefore, without conceding to the proposed combination of Patnaik and Adeli with either Lingen or Dickinson, such combinations still fail to teach or suggest Applicant's claimed invention. Accordingly, reconsideration and withdrawal of the rejections of Claims 3, 6, 9 and 12 under 35 U.S.C. §103 is respectfully requested.

Thus, it is submitted that Applicant's invention as set forth in independent Claims 1, 4, 7, 10, 13 and 14 is patentable over the cited art. In addition, dependent Claims 2, 3, 5, 6, 8, 9, 11

and 12 set forth additional features of Applicant's invention. Independent consideration of the dependent claims is respectfully requested.

In view of the foregoing, reconsideration and allowance of this application is deemed to be in order and such action is respectfully requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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